MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2015/2016

PMT0201 – MATHEMATICS II

(All sections / Groups)

3RD JUNE 2016
3.00 p.m. – 5.00 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of **5 pages** only including the cover page with **5 Questions.**

2. Attempt **ALL FIVE** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write your answers in the Answer Booklet provided, and **START EACH QUESTION ON A NEW PAGE.**

4. Show proper steps.

Question 1 (10 Marks)

(a) (i) Let $P\left(x, -\frac{4}{7}\right)$ be a point on the unit circle. If P is in Quadrant III, find the value of x.

(ii) Suppose t is the distance along unit circle in counterclockwise direction starting from the point (1, 0) ended at P, find $\sin t$, $\sec t$ and $\tan t$.

[3 marks]

(b) Suppose an angle α is in Quadrant II.

(i) Write $\tan\alpha$ in terms of $\cos\alpha$.

(ii) If $\cos\alpha = -\frac{2}{5}$, find the exact value of $\tan\alpha$.

[3 marks]

(c) Given that $f(x) = 3 + 3\cos\left(\frac{x}{2} + \frac{\pi}{8}\right)$.

(i) Determine the amplitude, period, phase shift and vertical shift of f.

(ii) Graph one complete period of $g(x) = 3\cos\left(\frac{x}{2}\right)$.

(iii) On the same axes, sketch one complete period of the function f. Indicate clearly the x and y intercepts of the graph.

[4 marks]

Continued...

Question 2 (10 Marks)

(a) Find the exact value of

$$\sin\left(\cos^{-1}\left(-\frac{3}{8}\right)\right)$$

[2 marks]

(b) A triangle ABC has $a=45$, $c=50$ and $\angle B=38°$.

(i) Sketch and solve the triangle.

(ii) Find the area of the triangle ABC.

Round your answers to FOUR decimal places.

[4 marks]

(c) Show that $1-\dfrac{\cos x \sin 2x}{2\sin x}=\sin^2 x$.

[2 marks]

(d) Solve $\sin\left(x-\dfrac{\pi}{3}\right)=\dfrac{-1}{2}$.

[2 marks]

Continued...

Question 3 (10 Marks)

(a) Suppose $z = \sqrt{3} - i$.

(i) Find the polar form of z.

(ii) Use De Moivre's Theorem to find z^5. Leave the answer in the form of $a + bi$ where $a, b \in \Re$.

[3 marks]

(b) Compute the limits. Show at least one intermediate step.

(i) $\lim_{x \to 1} \dfrac{x^2 - 6x + 5}{x - 1}$

(ii) $\lim_{x \to 3} \left[\dfrac{2x^2}{x - 3} + \dfrac{6x}{3 - x} \right]$

(iii) $\lim_{x \to 0} \dfrac{1 - \cos x}{\sin^2 x}$

[4 marks]

(c) Suppose

$$f(x) = \begin{cases} 3x + 1, & \text{if } x < 2 \\ 8, & \text{if } x = 2 \\ x^2 + 3, & \text{if } x > 2 \end{cases}$$

Determine whether f is continuous at 2. Show proper steps. **[3 marks]**

Question 4 (10 Marks)

(a) Consider the function $f(x) = x^2 + 3x$.

Find $f'(1)$ using the formal definition of derivative. **[3 marks]**

(b) By using the Chain Rule, find $\dfrac{dy}{dx}$ if $y = \left(x^2 + e^{-2x}\right)^{\frac{1}{4}}$.

Show proper steps and simplify your answer. **[4 marks]**

(c) Consider the function $s(t) = 4t^3 - 5t^2 + 2$. Find the velocity $v(t)$ and acceleration $a(t)$ when $t = 6$.

[3 marks]

Continued...

Question 5 (10 Marks)

(a) Compute the definite integral $\int_0^{\pi/4} \frac{1-\cos^2\theta}{\cos^2\theta} d\theta$. **[2 marks]**

(b) Consider the indefinite integral $\int x(x^2+1)^3 dx$.

(i) Find an appropriate choice for substitution variable u for the above integral.

(ii) By using the technique of substitution with variable u obtained in part (i), find the above integral.

[3 marks]

(c) Consider the line $y = 2x + 2$ and the curve $y = x^2 + 2$.

(i) On the same axes, sketch the graphs and shade the region enclosed by the graphs.

(ii) Find the points of intersection between the graphs obtained in part (i).

(iii) Find the area of the shaded region obtained in part (i).

[5 marks]

End of Page.